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FinTech and RegTech: Enabling Innovation while Preserving Financial Stability

by

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The exponential growth of FinTech is forcing financial regulators around the world to reconsider how best to balance the key regulatory objectives of innovation and financial stability. This paper considers the potential role of RegTech and smart regulation in facilitating this balancing act. Financial regulators have begun to use regulatory sandboxes in many parts of the world to achieve this end, however there is a clear opportunity for a further shift towards datafied and digitized regulation.

Introduction

Technology is transforming finance around the world at an unprecedented rate, offering new opportunities but also raising new risks. Financial regulators must develop new approaches to regulation, including through the use of technology, to balance the benefits of innovation and economic development with financial stability and consumer protection.

Prior to the Global Financial Crisis of 2008, financial innovation was generally viewed very positively by financial markets and many regulators, particularly those from major financial jurisdictions such as the US and UK. This often led to *laissez-faire*, deregulatory approaches to regulation particularly in global institutional markets. Post-Crisis financial regulatory reforms have seen a reversal of this approach – the regulatory pendulum has now arguably swung to the other extreme. Into this environment, rapid technological

evolution combined with post-Crisis regulatory changes have spurred the development of financial technology ("FinTech"). [1] FinTech includes new startups, established technological and e-commerce companies (which we call "TechFins") [2] as well as incumbent financial firms. FinTech promises innovation and economic growth through disruption of traditional financial services businesses, yet it also poses a major challenge to the post-Crisis regulatory paradigm.

As FinTech has gained in significance, financial regulators have been forced to consider how to balance the traditional regulatory objectives of financial stability and consumer protection with the objectives of growth and innovation. This balancing has been a particular challenge in the conservative post-Crisis regulatory environment, which has largely been focused on preventing disruption as opposed to encouraging it in the way hoped by many FinTechs. The result so far is a process of regulatory innovation, which includes the use of technology ("RegTech") [3] and changes to existing regulatory frameworks such as the establishment of regulatory sandboxes.

We have so far seen four possible regulatory approaches to FinTech innovation: (1) doing nothing (which could be a restrictive or a permissive approach, depending on the context); (2) flexibility and forbearance (under which existing rules are relaxed in specific contexts); (3) restricted experimentation (e.g sandboxes or piloting); and (4) regulatory development (in which new regulations are developed to cover new activities and entrants). We argue that what is needed is "smart regulation," a distinct approach that transcends these boxed ways of thinking and uses each of them, and more, in an integrated approach to balancing the need for stability and the promotion of innovation and consumer protection.

Smart regulation is the result of a comprehensive review of existing regulatory systems in light of rebalanced objectives and emerging technology. From the standpoint of application of technology to regulation ("RegTech"), it involves digitization of systems which in turn supports application of advanced analytical approaches to yield better regulation. It also involves the development of new financial infrastructure, including digital identification systems and frameworks for payments and other transactions. Beyond RegTech, smart regulation requires analysis of existing systems in order to build entirely new approaches which take into account balanced objectives of economic development, financial stability

and consumer protection. Smart regulation requires rethinking regulation in all its forms in order to develop new approaches and new systems in order to support the new form of financial system which is rapidly evolving.

Financial Innovation and the Global Financial Crisis

The Global Financial Crisis challenged the generally positive view of the role of innovation in financial services, particularly that embodied in product innovations such as collateralized debt obligations (CDOs). Despite the experiences of the Crisis, financial and technological innovation matters deeply, and regulators need to perform a balancing act between preserving stability, protecting consumers, and promoting innovation. On the one hand, financial and technological innovation can enhance market efficiency by reducing transaction and financial intermediation costs.[4] In particular, it can serve as a catalyst for providing new solutions to long-standing problems, including financial exclusion, the quality of consumer decision-making,[5] agency costs at the front-end of financial services, and high compliance costs.[6]

On the other hand, financial and technological innovation also brings new risks. Financial innovations like derivatives and securitization have important roles in risk management and financial resource allocation, yet they also played a key role in facilitating the Global Financial Crisis.[7]

Among the main financial regulatory mandates, two were of key importance as the 2008 Crisis unfolded: first, consumer protection (particularly retail clients, investors and depositors);[8] and second, financial market stability as a whole.[9] While the *micro* dimension of regulation focuses on individual institutions, the systemic or *macro* perspective looks at the impact of counterparty interrelationships and/or systemically important financial institutions (SIFIs), often described under the rubric of too-connected-to-fail or too-big-too-fail.[10] In the wake of the Crisis, there has been a major process of reregulation, designed in particular to address both micro and macro problems.

The Evolution of FinTech

FinTech emerged against this backdrop of post-Crisis regulation.

Technology and finance have had a very long relationship, with each responding to developments in the other over an extended evolutionary process.[11] This evolution can be characterized over the past 150 years into four major eras, but in the last 10 years, the pace of change in both finance and technology has moved more rapidly than ever before, resulting in the emergence of a new term and era: FinTech.[12]

This new era of FinTech is marked by the speed of change and the range of new entrants in the financial sector. FinTech startups and IT and e-commerce TechFins[13] all compete with traditional financial institutions across developing, emerging and developed markets.[14] In this context, there are new opportunities for innovation and growth, but also new challenges, particularly for regulators. Regulators must find a way to prevent destructive disruption while also encouraging and supporting innovative disruption.

FinTech: Furthering Innovation by Regulation or Competition?

One principal effect of the Crisis has been a very cautious regulatory approach to innovation, particularly in light of concerns that regulatory capture by large financial institutions was a factor which contributed to the crisis. However, the rapid evolution of FinTech in the past decade, increasing policy pressure to re-start economic growth (e.g. the JOBS Act in the United States and the deregulatory priorities of the Trump administration), [15] and an international agenda to foster financial inclusion [16] have combined to bring pressure to bear on regulators to support innovation, particularly digital disruption.

This requires regulators to balance support for innovation with their core regulatory mandates of systemic stability and consumer protection. Four approaches have so far emerged to this challenge.

The first approach involves doing nothing: either by intent or otherwise. Doing nothing can involve simply not regulating FinTech and could be characterized as a permissive or *laissez-faire* approach. China, especially before 2015, is often highlighted as a leading and highly-successful example of this approach.[17] This may be beneficial for innovation and development but also brings risks, as in the Chinese example. Doing nothing however can also simply involve requiring FinTech firms to comply with the general framework of

financial regulation as it applies to traditional participants, often with a restrictive result. This approach may protect against risk at the cost of stifling innovation. This is the approach of most jurisdictions to date.

Second, regulators can choose to allow certain amounts of flexibility on a case-by-case basis. This approach can be classified as one based on forbearance.[18] Indeed, many regulators facing innovation, and equipped by a legislature with a mandate which allows consideration of economic benefits, have granted restricted licenses and partial exemptions for innovative firms so that the regulator can acquire sufficient data and experience with innovation. Many regulators have pursued this approach rather than following China's lead of initially not regulating innovative firms, and only stepping in with regulation after the innovations had reached a certain size and significance.[19]

Third, regulators can provide a structured context for experimentation—by instituting a regulatory sandbox or (as in China since 2015) adopting structured piloting exercises. While a new term in financial services, the sandbox concept is by no means novel, with its origins in computer science. In finance, a regulatory sandbox refers to a regulatory "safe space" for financial technology services. At a basic level, the sandbox creates an environment for businesses to test products with less risk of being "punished" by the regulator. In return, regulators require applicants to incorporate appropriate safeguards.[20] There are currently over twenty sandboxes announced or in operation globally.[21] Regulatory sandboxes seek to support competitive innovation in financial markets. Eligibility to enter a sandbox is standardized and publicized, thus requiring market participants to articulate their added-value in a pre-defined format.[22] This is cost-effective for participants and resource-effective for regulators. Sandboxes bring an important dimension of transparency to ad hoc forbearance or dispensation practises, and allow easier comparison among potential entrants to the sandbox.

However, sandboxes, while providing transparency in the entry criteria and processes, are very much human-driven and analogue in their monitoring. Sandboxes as currently conceived are not scalable – the current 25 participants in the UK Financial Conduct Authority sandboxes are insignificant compared to the large number of licenced market participants in the United Kingdom (over 56,000 firms).[23] For this reason, sandboxes need

to be made smarter and equipped to self-monitor the activity within them, as opposed to just being a process-driven application method to gain entry, typically for a limited time, to a regulatory safe space.

Fourth, a formal approach could be adopted, in which existing regulations are reformed or new regulations are developed in order to provide a more appropriate and balanced framework for new entrants and new activities. This has been the approach in a number of jurisdictions, but so far limited to specific areas such as crowdfunding, payments or P2P lending activities.

Support for competitive innovation in financial markets is certainly not the exclusive preserve of developed jurisdictions impacted by the Global Financial Crisis, such as the United States and United Kingdom. Financial innovation has been transformative in emerging markets such as China,[24] India[25] and Kenya,[26] all of which are re-thinking their financial markets, and none of which has announced a regulatory sandbox initiative.

China is often applauded for adopting a *laissez-faire* approach before proceeding to regulate. This approach allowed market participants to test without immediate repercussions from the regulator. In practice, this meant that, at least before 2015, China's need for regulatory sandboxes was limited, as China itself at the time was essentially a national-level sandbox. However, China did not persist with its entirely laissez-faire approach. After new pooled products were issued by Alibaba Group, regulators woke up one morning to discover the world's fourth largest ($90 billion) money market fund had grown within only nine months (and is now the world's largest money market fund at $165 billion[27]). This lack of initial visibility and regulatory market comprehension has pushed China to pursue a path of developing a new, comprehensive regulatory approach, one that is stricter but still more balanced and pro-innovation than in many other countries.[28]

It comes as no surprise that innovation is less restricted in less regulated parts of the world.[29] Even in the absence of prescriptive rules, regulation can weaken innovative forces, because establishing new, solution-driven, potentially innovative firms is more expensive in a strictly regulated environment than in an accommodative one. The above analysis

suggests that no single regulator has a monopoly on the best framework for innovation and regulatory sandboxes are not always the best addition to regulators' toolkits.

Some regulators understand their standard mandates of financial regulation—financial stability and consumer protection—to include furthering innovation, while others interpret their mandates more narrowly and will require an explicit mandate to further innovation. In April 2017, U.S. states represented by the Conference of State Bank Supervisors, challenged a FinTech special charter issued by the Office of Comptroller of the Currency (OCC) on the grounds that the Office lacks a mandate to further innovation. The capacity of the OCC's plans to charter FinTech companies as "special national banks" was challenged, *inter alia*, on the grounds that to do so exceeds the OCC's statutory authority.[30]

On balance, the express provision of the promotion of innovation in their mandate could be most useful—at least for financial centers that wish to compete by signaling regulatory flexibility to the market. Such messages are typically first issued by regulators establishing FinTech contact points[31] or appointing FinTech officers.[32] This is then often followed by the regulator initiating market meetings, discussions and consultations,[33] and then in some jurisdictions establishing a sandbox. Indeed, the major contribution of a sandbox from a regulator's perspective may lie, not in providing a typically highly restrictive safe space, but in its signalling function: communicating regulator flexibility towards innovative enterprises.

It remains unclear as to what will comprise the best model in the future. In contrast to the pattern of the previous ten years, a positive, forward-looking regulatory momentum is building. Regulators in global financial centers have increasingly realized the potential benefits of FinTech for consumers and of RegTech for their primary mandates. They are also mindful of the potential harmful impact of excessive post-Crisis stringency on the competitiveness of incumbent financial intermediaries. An increasing number are beginning to experiment with novel approaches to regulation, seeking to unlock innovative potential while at the same time minimizing risks. Over time, market participants are able to identify the signs of regulatory interest in promoting innovation.

RegTech

In addition to the challenges of regulating FinTech, technology is playing an ever-increasing role in regulation itself, particularly financial regulation. This ever-growing use of technology in finance is gradually putting pressure on regulators to move from regulations designed to control human behavior to regulation that seeks to supervise automated processes.[34] In other words, FinTech's growth has elicited the need for RegTech.[35] "RegTech" is a contraction of the terms "regulatory" and "technology,"[36] and describes the use of technology, particularly information technology (IT), in the context of regulation, monitoring, reporting and compliance.[37]

RegTech not only offers the potential for massive cost savings in meeting the compliance obligations of financial institutions, but more importantly offers the opportunity for regulators to perform their functions more effectively.[38] The combination of FinTech and RegTech offers the potential to frame the development of a very different financial system from that which exists today. China offers perhaps the best example of the speed and magnitude of change possible, and India perhaps the best example of a transition currently in progress.[39]

Smart Regulation

The increasing commoditization of core technologies such as machine learning and artificial intelligence is opening a Pandora's box of new FinTech and RegTech challenges, opportunities and solutions. Combining RegTech with new approaches to regulating FinTech presents the opportunity to consider regulation more broadly, an opportunity for smart regulation.

FinTech Trends

In designing financial regulation for the new financial sector which is emerging, three major market trends need to be taken into account.

First, FinTech innovation is increasingly happening in diverging geographical clusters away from the traditional birthplaces of tech innovation such as Silicon Valley. This means that the monitoring of new technologies (or "emerging risks" as regulators may call them) is more difficult. For some perspective, over 100 million start-ups are established each

year[40]—although discovering and monitoring the potential risks which may emerge from such a large amount of ventures is a vexing challenge, more companies means more potential avenues for future growth as well as new risks.

Second, the rapid growth of FinTech and RegTech businesses since 2016 demonstrates the increasingly critical role of technology.[41] The self-learning nature of algorithms is rapidly transforming the scope and potential for automated regulation.[42]

Third, the increasing amount of data in the world is fueling all tech industries,[43] including RegTech, FinTech and TechFin. The potential actionable insights derived from data processing often extend beyond our current imagination but are also associated with emerging risks.[44]

The regulatory context surrounding Fintech is fundamental to its regulation. Innovation requires smart regulation.

Principles vs. Rules

This new automated and proportionate regime should be built on shared fundamentals of financial regulation. For example, while all regulators agree on the importance of combatting money laundering and financing of terrorism (AML/CFT) and international bodies are set up to ensure minimum standards set by the Financial Action Task Force,[45] details of implementing these recommendations vary among countries casting doubt on the efficiency of international coordination of AML/CFT rules.[46] Lack of innovation in this area may thus be equally the result of insufficient harmonization and regulatory stringency.[47] To resolve this tension, regulators will need to focus on their broader mandates as defined by applicable legislation (i.e. consumer protection, financial stability, competition and prudential regulation) as opposed to attempting to apply overly rules-based approaches which will inevitably trail the velocity of innovation and overly stretch regulatory resources. In other words, being ‘”technologically neutral”’ should not be used as an argument excusing regulators from the need to understand the impact of new technologies impacting processes (e.g. biometric identification for payments) or business models (e.g. alternative data credit scoring). Instead “technological neutrality” should mean that regulators do not seek to “regulate” technological innovations, but instead look

at how technology enables a process with an outcome that ought to be subject to regulation (e.g. it is not automated investment that is the problem, but the risk of fraud or improper investment advice).[48]

Competition vs. Innovation

The key is not the regulation of technological innovation, but instead the regulation of competition in financial markets. Defining the boundaries of competition and financial and technological innovation is a challenge for regulators. The objective of smart regulation is not to force innovation but rather to lower entry barriers for innovative business models while keeping risk controls intact.

Regulatory Innovation: Toward RegTech

Where innovation is necessary to be pursued by law, however, is on the side of regulators. Traditional rule-based licensing schemes have raised minimum costs of doing business and stifled innovation.

As competition spurs the arrival of new participants, regulatory capacity to experiment with new supervisory and reporting models increases. As the bargaining power of start-ups with regulators is disproportionality low compared to large established incumbent licensed enterprises, this provides regulators with the opportunity to engage in a sequenced reform process. Here, novel approaches beyond a heavy-handed supervisory process with punishment and sanctions as key instruments need to be developed. Those could include regulatory sandboxes, but also other means adequate to balance competition and innovation.

Such approaches must consider the limits of traditional licensing and supervision which – besides raising minimum costs – include information asymmetry and delays in response. Novel regulatory approaches could strengthen supervision while opening the gates for new business ideas. In particular RegTech could function as key instrument: On the one hand, incumbent financial institutions and supervised entities could accept digitized monitoring and reporting. On the other hand, new market participants may trial digital regulation from the onset.

Combining a regulator's openness to innovation with RegTech would free resources and enhance mutual learning. It would allow experimentation at the margin (this assumption is supported by the low numbers of firms in sandboxes) whilst the bulk of the industry is gradually brought to new standards via the digitization of regulatory requirements themselves (in short: RegTech). Risks incurred by unregulated, yet sandboxed (i.e. monitored) firms may be accepted – for the very reason that they could kick-start innovation while traditional regulation sets higher-than-desired barriers to innovation.

Conclusion

Regulation of technological innovation in finance must seek to balance competing objectives, especially of innovation, financial stability and consumer protection. This is a particular challenge for regulators ten years after the Global Financial Crisis as that crisis prompted a massive focus on financial stability and enhanced consumer protection. Against this background the great promise of FinTech has begun to alter regulatory attitudes and approaches to regulation of technological innovation.

An increasing number of jurisdictions are considering how to best balance support for FinTech with the major regulatory objectives of financial stability and consumer protection. Some jurisdictions have done nothing, resulting in responses ranging from *laissez-faire* policies in the case of China to very restrictive ones in jurisdictions which require new entrants and activities to comply with existing regulatory systems. Others grant case-by-case relaxations of existing rules for FinTech, while yet others are developing more structured sandbox approaches or other more comprehensive efforts to develop regulatory systems appropriate to FinTech.

In addition to its impact on finance, technology is also increasingly impacting regulation in the form of RegTech, including by industry (for instance in the context of AML/CFT, reporting and risk management) and by regulators themselves increasingly using technology to enhance performance of their own mandates (for instance in the context of cybersecurity and macroprudential surveillance). Further, some countries (of which India is the leading example) and market participants (particularly in the context of blockchain

and distributed ledger technology) are beginning to consider how technology can be used to redesign financial systems.

All in all, going forward, regulatory sandboxes are but one early step in a process that will embrace new smart—digitized and datafied—regulatory systems and a new smart approach to regulation that draws on all available tools, in a sequenced structured manner, to achieve the balancing act required of regulators.

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[4] *See* Arner, Barberis and Buckley, *supra* note 1.

[5] Cf. on robo-advisory, *see* Marika Salo and Helena Haapio, *Robo-Advisors and Investors: Enhancing Human-Robot Interaction Through Information Design* (Feb 23, 2017), in Erich Schweighofer et al. (eds), *Trends and Communities of Legal Informatics. Proceedings of the 20th International Legal Informatics Symposium IRIS 2017* (Österreichische Computer Gesellschaft, 2017):411.

[6] *See* Arner, Barberis, and Buckley, *supra* note 3.

[7] *See* Ross P. Buckley and Douglas W, Arner,, *From Crisis to Crisis: The Global Financial Systems and Regulatory Failure*, (New York, Wolters Kluwer, 2011); *See* Thomson Reuters, *Thomson Reuters Annual Costs of Compliance Survey Shows Regulatory Fatigue, Resource Challenges and Personal Liability to Increase throughout 2015* (May 13 2015), https://www.thomsonreuters.com/en/press-releases/2015/05/cost-of-compliance-survey-shows-regulatory-fatigue-resource-challenges-personal-liability-to-increase.html, (last accessed Jun 16, 2017).

[8] Sumit Agarwal, Gene Amromin, Itzhak Ben-David, Souphala Chomsisengphet and Douglas D. Evanoff, *Predatory Lending and the Subprime Crisis, Journal of Financial Economics* 113(1) (2014).

[9] Cf. Dirk A. Zetzsche, *Investment Law as Financial Law: From Fund Governance over Market Governance to Stakeholder Governance?*, in *The European Financial Market in Transition*, edited by in H.S. Birkmose, M. Neville and K.E Sørensen, (New York, Wolters Kluwer, 2012): 339, 343; Douglas W. Arner, *Financial Stability, Economic Growth and the Role of the Law* (New York, Cambridge University Press, 2007).

[10] Steven L. Schwarcz, *Systemic Risk*, *Georgetown Law Journal* 193 (2008): 204; Iman Anabtawai and Steven L. Schwarcz,, *Regulating Systemic Risk: Towards an Analytical Framework*, *Noctre Dame Law Review* 86, 4 (2011): 1349.

[11] *See* Arner, Barberis and Buckley, *supra* note 1.

[12] Ibid. These four major eras can be categorized as FinTech 1.0, FinTech 2.0, FinTech 3.0, and FinTech 3.5. FinTech 1.0 runs from around 1866 to about 1967, in which the financial services industry, while being heavily interlinked with technology, still remained largely analogue. FinTech 2.0 runs from about 1967 to 2008 and saw the increasing development of digital technology for communications and processing of transactions, and the digitization of the finance industry in developed countries. FinTech 3.0 begins with the turning point of the 2008 Global Financial Crisis and is characterized by the emergence of innovative market players in developed nations in the financial services industry, a new group of actors (typically FinTech startups) applying technology to financial services. FinTech 3.5 is characterized by the substantial growth in Asia and Africa since 2008 in the provision of e-money over mobile phones, prompted primarily by the pursuit of financial inclusion and economic development, rather than as a reaction to the financial crisis which was the driver in the West.

[13] In the case of TechFins, non-financial firms are entering financial services business. Such as Amazon, Apple, Google, Microsoft and Tencent. *see* Zetzsche et al., note 2.

[14] *See* Zetzsche, Buckley, Barberis & Arner (2018 forthcoming).

[15] *Start Our Business Startups Act*, H.R. 3606, 112th Cong. (2012).

[16] Reflected in Goal 8 of the UN Sustainable Development Goals and in the 2014 G20 Financial Inclusion Action Plan. United Nations, "Sustainable Development Goals", https://sustainabledevelopment.un.org/?menu=1300, (last accessed Jun 16, 2017); Global Partnership for Financial Inclusion (GPFI), "Financial Inclusion Action Plan", http://www.gpfi.org/publications/financial-inclusion-action-plan, (last accessed Jun 16, 2017).

[17] Weihuan Zhou, Douglas W. Arner and Ross P. Buckley, *China's Regulation of Digital Financial Services: Some Recent Developments*, *Australian Law Journal* 90(5) (2016): 297-300; *see* Arner, Barberis and Buckley, supra *note* 1: 26; Sonia Barquin and Vinayak HV, *Capitalising on Asia's digital-banking boom*, McKinsey & Company (Mar 11, 2009), www.mckinsey.com/industries/financial-services/our-insights/capitalizing-on-asias-digital-banking-boom (last accessed Jun 17 2017).

[18] The same approach is suggested by Arner, Barberis and Buckley, *supra* note 1: 27.

[19] Douglas W. Arner and Janos Nathan Barberis, *FinTech Regulations Recent Developments and Outlook* (1 April 2015), Asian Institute of International Financial Law.

[20] For instance, *see* Hong Kong Monetary Authority, *FinTech Supervisory Sandbox (FFS)* (Sep 6, 2016):2, http://www.hkma.gov.hk/media/eng/doc/key-information/guidelines-and-circular/2016/20160906e1.pdf (last accessed Jun 16, 2017); *see also* Monetary Authority of Singapore, *MAS FinTech Regulatory Sandbox Guidelines* (Nov 16, 2016): marginal no 2.2, 6.2, 6.2.g,

http://www.mas.gov.sg/~/media/Smart%20Financial%20Centre/Sandbox/FinTech%20Regulatory%20Sandbox%20Guidelines.pdf (last accessed Jun 17, 2017); *see also* Bank Negara Malaysia, *Financial Technology Regulatory Sandbox Framework* (Oct 18, 2016): marginal no. 6.1. ff.; http://www.bnm.gov.my/index.php?ch=57&pg=137&ac=533&bb=file, (last accessed Jun 16, 2017).

[21] *See* Arner, Barberis and Buckley, *supra* note 3: 46.

[22] This is particularly so in the leading example of the Financial Conduct Authority in the UK, *see* Arner, Barberis and Buckley, *supra* note 3: 46.

[23] Financial Conduct Authority, "About Us" (last modified Apr 18, 2017), https://www.fca.org.uk/about/the-fca>, (last accessed Jun 15, 2017).

[24] For example, Alibaba alone has fulfilled two main government policy objectives. It has created 2.87 million direct and indirect opportunities, and provided over 400,000 SMEs with loans ranging from $3000 to $5000. *See* supra, note 1: 24.

[25] The best example is 'India Stack', a number of initiatives which set the stage for a dramatic transformation and digitalisation of the Indian financial system, *see* Abhijit Bose, *India's FinTech Revolution is Primed to Put Banks Out of Business* Tech Crunch (Jun 14, 2016), https://techcrunch.com/2016/06/14/indias-fintech-revolution-is-primed-to-put-banks-out-of-business/, (last accessed Jun 17, 2017)

[26] In particular, M-Pesa, the mobile money product under Safaricom. In under 5 years, payments made through the platform surpassed 43% of Kenya's GDP. *See* Daniel Runde, *M-Pesa and the Rise of the Global Mobile Money Market*, Forbes (Aug 12, 2015), https://www.forbes.com/sites/danielrunde/2015/08/12/m-pesa-and-the-rise-of-the-global-mobile-money-market/#9c928ab5aecf , (last accessed Jun 17, 2017).

[27] Cf. Tjun Tang, Yue Zhang, David He, *The Rise of Digital Finance in China – New Drivers, New Game, New Strategy*, The Boston Consulting Group (2014):4, http://www.bcg.com.cn/en/files/publications/reports_pdf/BCG_The_Rise_of_Digital_Finance_in_China_Oct_2014.pdf (last accessed 6 Apr 2017); Shaohui Tian, *Alibaba's Yu'e Bao becomes Largest Money Market Fund Globally*, Xinhua Net (Apr 28, 2017), http://news.xinhuanet.com/english/2017-04/28/c_136243985.htm, (last accessed Jun 16, 2017).

[28] Cf. Weihuan Zhou, Douglas W. Arner and Ross P. Buckley, *Regulating FinTech in China: From Permissive to Balance*, forthcoming in *Handbook of Digital Finance and Financial Inclusion: Cryptocurrency, FinTech, InsurTech, and Regulation (II)*, edited by David Lee and Robert Deng, (New York, Elsevier, 2017), *in press*.

[29] For instance, in Uganda and Kenya biometric data based on iris scan and finger prints taken via smart phones after birth provide the newborn's initial identification and functions as basis for issuing the birth certificate, *see* GSMA, *Regulatory and Policy Trends Impacting Digital Identity and the Role of Mobile* (Oct 26, 2016) http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/10/Regulatory-and-policy-trends-impacting-Digital-Identity-and-the-role-of-mobile.pdf, (last accessed Jun 17, 2017).

[30] V. Gerard Comizio and Nathan S. Brownback, Fried, Frank, Harris, Shriver & Jacobson LLP, *State Bank Regulators Challenge OCC's Authority to Issue FinTech Charters*, Harvard Law School (Jun 4, 2017), https://corpgov.law.harvard.edu/2017/06/04/state-bank-regulators-challenge-occs-authority-to-issue-fintech-charters/ (last accessed Jun 16, 2017).

[31] Securities and Futures Commission (Hong Kong), "Welcome to the FinTech Contact Point" (last updated May 23, 2017) http://www.sfc.hk/web/EN/sfc-fintech-contact-point/, (last accessed Jun 17, 2017).

[32] Angela Tan, *MAS Appoints Ex-Citi Banker to Head New FinTech Innovation Group from Aug*, Business Times (Jul 27, 2015), http://www.businesstimes.com.sg/banking-finance/mas-appoints-ex-citi-banker-to-head-new-fintech-innovation-group-from-aug, (last accessed Jun 17, 2017).

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